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ABSTRACT

This paper discusses a number of problems associated with distance education methods used in adult education and training fields, including limited opportunities for dialogue and group interaction among students and between students and tutors; the expense of updating and modifying mass-produced print and audiovisual materials; and the relative inflexibility of many distance education systems in responding to the needs, interests, and experiences of individual students. Two examples of computer-mediated communication--electronic mail and computer-conferencing--are described in terms of their potential to "humanize" the design of distance education projects, and in terms of their special features: (1) lower communication costs; (2) asynchronous communications; (3) ability to store communications; and (4) organize and structure inputs, outputs, and communication patterns in a variety of different ways. Three main challenges in trying to use computer-mediated communication in the distance education situation are then discussed together with suggested solutions: scale (there are much smaller groups of students than in many of the typical distance teaching projects); integration (the new technology must be integrated with existing print and audiovisual media, as well as into complex course development and presentation systems); and optimization (the new technologies should be used to provide maximum benefit in terms of quality learning). It is concluded that computer-mediated communication has the potential for being more than just an electronic substitute for correspondence tuition and face-to-face meetings in the distance education context. (8 references) (CGD)

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Introduction

Although distance education methods have now come of age, and are seen as being successful in the adult education and training fields in a wide range of contexts, it would be foolish to ignore the real problems associated with these pedagogies. These are particularly evident in the national and regional large-scale distance teaching systems of the 'Open University type', which have been established in many countries during the last two decades (although they also appear amongst the more traditional and longer established correspondence education institutions catering for large student enrolments). Some of these problems are linked to the shift of the major cost elements in distance education, as opposed to face-to-face education, from student-related, recurrent, teaching costs to course-related materials development and infrastructure costs; they include:

- the limited opportunities for dialogue and group interaction amongst students, and between students and tutors, within what is predominantly a one-way communication system catering for geographically widely dispersed populations;
- the expense of updating and modifying mass-produced print and audio-visual materials: in many cases, a course life of 5–8 years seems to be considered as necessary to amortise materials development costs, (although the use of desktop publishing technologies is certainly changing the economics of *print* production);
- the relative inflexibility of many distance education systems in responding to individual student's needs, interests, and experiences.

Some of these problems can become particularly acute when a system originally designed for handling very large population introductory courses is required to deliver a wide range of higher-level, low-population courses, in response both to the diversity of student interests and to expectations of what constitutes a comprehensive curriculum. In 1985, for example, 44 out of 129 post-Foundation Level Open University undergraduate courses had less than 200 enrolments; a further 21 had between 200 and 300 students. Given that these students are spread all over the country, the opportunities for face-to-face contact are minimal.

In the design of any distance education project now, in the late 1980s, attention should be paid to the ways in which developments in information and communication technologies could produce flexible systems with more scope for two-way communication, for updating of course materials, and for 'customising' of courses, than in the more traditional distance and correspondence education institutions. This need not necessarily imply greatly increased running costs, even if it does imply a shift away from an emphasis on front-end costs. In the not too distant future, even in the Open University, course presentation costs might even be reduced if every tutor and student were supplied on registration with a micro-computer with communications facilities. This could lead to reductions in the costs of some elements of tutorial provision, in the costs of mailing and processing a proportion of the written and printed materials, and in the areas of student and course administration (e.g. through on-line access to databases containing relevant information, on-line registration facilities, etc.). But, above all, it would help overcome the problem of isolation of students and tutors in distance education programmes, by providing access to electronic mail and computer conferencing facilities, thus making the system more interactive and convivial.

Electronic mail can permit almost instantaneous turn-round times on text communications between a student and tutor. Computer conferencing, much more interestingly, opens up the possibility of group communication and collaborative work, regardless of space and time constraints. In both cases, we have an example of a computer technology with a strong potential 'humanising' element – able to provide opportunities for discussion, negotiation, and interaction within educational systems which are often singularly lacking in such features.

Electronic mail

There exists a wide range of 'store and collect' electronic mail software packages, adapted both to particular makes of mainframe

computer and to specific user needs. They all have a number of structural features in common, although the particular commands used and the design of the user interface in general vary from one package to another.

The basic unit of an electronic mail system is a 'message' – a discrete item of text produced by a sender and addressed to one or more named readers. Messages can vary in length from a few words to very many pages of text, although, in practice, many electronic mail systems impose an upper limit on the size of an individual message. In most systems, the text of each message is accompanied by a 'header' containing information about the message (sender, addressee/s, time and date sent, title or key words, message size expressed in number of characters or number of lines, and status – e.g. new, unread, read, answered, etc.). Messages are routed by the system to the addressee's mailbox (which is, of course, a computer file) on the central computer, and wait there to be read the next time the addressee logs in to the system. At this point, the latter can then read the message, reply to it, leave it in his or her mailbox for later attention, delete it, forward it to someone else, and/or file it.

Most electronic mail systems allow users to search for messages according to a number of parameters – including information held both in the message 'header' and in the text of the message. Thus a user can ask to view all messages in his or her mailbox from a particular person, or sent since a specific date, or containing a particular word or sequence of words in either the message title or text. Some systems include a 'recorded delivery' feature, where the sender of a message is automatically notified when the recipient has accessed it.

Group communication – as opposed to messaging between individuals – can be achieved in two ways in electronic mail systems. A circulation list can be set up for sending a message to a named list of individuals, but this becomes cumbersome if it involves more than a few people, and replies copied to everyone else on the list by each person get mixed up with all one's other mail. The alternative is for the system operator to set up a bulletin board on a particular topic (effectively, a mailbox for that topic) to which all concerned send their messages, which are then available to all members registered on the particular bulletin board. A bulletin board editor is then needed, with responsibility for deleting old and unwanted messages, editing messages, and providing summaries and progress reports of the information and discussions on the board.

Computer conferencing

Computer conferencing systems, although based on electronic mail, offer, in addition to person-to-person messaging, more sophisticated

group communication facilities than topic-based bulleting boards. Individual users can join 'conferences' on specific subjects of interest. A given user may be a member of several such conferences – each conference containing the cumulative total of messages sent to it by the various conference members. As in electronic mail, conferencing on such a system is asynchronous – it does not require that all members be present and active at the same moment. Unlike face-to-face conferencing, or telephone or video-conferencing, participants are not put 'on the spot' to respond immediately to questions and to other participants' intervention. These can be read and reflected on at ease, and one's own contribution sent in when it is ready and at a time which is convenient. The conference transcript becomes a valuable record which can be consulted at leisure, and even edited and used as a basis for a subsequent report, as all contributions to a conference are automatically stored on the system.

The more sophisticated systems offer a range of facilities to enhance a variety of forms of group communication. These may include:

–different categories of conference membership corresponding to different participant roles, for example: observer (read only membership); participant (read and write membership); chairman (with powers to add and remove members, and to edit messages); and so on;
– the ability to delete or revise messages previously sent in to a conference, and to assign to others the right to do this for one's own messages;
– procedures for threading one's way through related messages in the same conference – via branching or message-linking options;
– structured message facilities, for example, for polling conference members on topics of interest, for voting, or for advertising;
– facilities for cooperative production of reports and documents, where individual users can edit and modify drafts submitted by others, in an iterative process;
– the ability to 'customise' commands and various other aspects of the system so as to produce a tailor-made version for specific purposes and groups.

There are a number of conferencing systems which are currently available commercially – the best known include PARTICIPATE, PortaCOM, eFORUM, CONFER, COSY, and NOTEPAD. Some were originally developed for government and military applications; others for business use; others for enhancing communication amongst communities of university researchers and scientists. The earliest and best-known system, and still in many ways the most

flexible (as it is undergoing constant evolution as a computer conferencing test-bed and laboratory) is EIES (Electronic Information and Exchange System), developed by Murray Turoff at the New Jersey Institute of Technology. Current work on EIES includes a project to develop a version specifically for education and training purposes, and which will include sophisticated branching facilities, and the ability to handle graphic inputs and outputs.

Computer-mediated communication for distance education

Electronic mail and computer conferencing are examples of computer-mediated communication. As has been shown, such systems allow individuals and groups of people to carry on discussions and conversations over a computer network, regardless of time and place constraints. This technology is in many ways an ideal medium for students, tutors and course developers involved in distance and open education courses. Four features stand out as being practically tailor-made for such clients.

1 Once the equipment (microcomputers, modems, mainframe) and necessary software and network facilities are in place, *communication costs can be very low.* For example, the great majority of OU tutors and students should be able to access the University's own national computer network at local call rates (less than 50p per hour at evenings and weekends). Even in cases where communications have to pass through public packet-switched systems, the charges are far less than for long-distance voice telephone calls.
2 Communications (whilst being virtually instantaneous to the mainframe computer) are *asynchronous*, unlike face-to-face meetings or telephone calls and conferences. Messages can be entered and retrieved when convenient to users of the system, permitting time for reflection and for thoughtful composition.
3 All communications are *stored* until deliberately deleted, and can be filed in such a way as to be immediately accessible when required – a feature not found with face-to-face and telephone communication unless burdensome recording procedures are employed.
4 The processing power of the mainframe computer and its CMCS software is used to *organise and structure* inputs, outputs, and communication patterns in a variety of different ways. (In addition to the computer conferencing features listed above, tools can include private notepads for personal documents and notes; signalling of current on-line participants, with the possibility of synchronous communication; and a directory of members with users' names, addresses, interests, etc.).

As far as pedagogical issues are concerned, there would seem to be three main challenges in trying to use computer-mediated communication in the distance education situation.

1 *Scale*: most current applications of computer conferencing in the educational field have concerned small groups of students (in the tens, say), rather than the much larger student populations typical of many distance teaching projects.
2 *Integration*: this new technology must be integrated, not only with existing print and audio-visual media, but also into complex course development and presentation systems, involving central teams preparing materials to be tutored by intermediares. To make best use of these new technologies, it will undoubtedly be necessary to re-think many of the standard course development and presentation methods, and this will probably involve major enhancements of tutors' roles.
3 *Optimisation*: it makes little sense to use these technologies merely to replace existing procedures (e.g. electronic mail as a substitute for postal correspondence or phone calls, computer conferencing as a substitute for face-to-face tutorials). The unique characteristics of computer-mediated communication should be used where they can provide maximum benefit in terms of the quality of learning which they can promote.

The problem of *scale* can be tackled in several ways. A clear distinction should be made between one-way and interactive use of computer-mediated communication in the former case, one could envisage, for example, the use of a database under the control of a designated member of a course development team, to be used for stop-press and updating items (thus helping to alleviate the problems of inflexibility and 'fossilisation' of mass-produced course materials, referred to at the beginning of this chapter). Course developers and tutors might be invited to submit suggested items for inclusion to the database editor, and students would have read-only access. Such a facility would work equally well regardless of the total number of students on the course – in fact the cost advantage of computer-mediated communication over postal mailings increases with numbers in this case.

In the latter case – interactive use in the individual or group mode – the tutor group might be considered as the basic unit within which communication occurs. The OU norm of 25 students to one part-time tutor fits well with what is probably an optimal group size for computer conferencing applications such as on-line seminars and tutorials. It is also a size which easily permits the establishment of self-help groups, especially as the students would have had the opportunity to meet face-to-face and thus get to know each other personally.

However, this does not imply that communication should occur

only within individual tutor groups. One could envisage, in addition, the setting up of a conference which could permit all tutors and course developers to share information. Such a facility could be used for briefing, comparing marking and tuition practices, obtaining specialist help, evaluation, and feedback. Finally, on relatively low population courses, it would not be out of the question to have a general course conference to which all students and tutors could contribute.

Integration of computer-mediated communications into an existing distance teaching system is a more problematic issue than that of scale. It is probably only through the experience of using the technology that the best ideas will appear for integrating the medium with core course materials. In this context, it might be useful to explore the potential of computer communication for course development. Experience of use of EIES by groups working on common projects demonstrate that computer conferencing can be a very effective medium for achieving consensus and for joint preparation of working group reports. Such a facility would certainly make it easier for dispersed members of development teams to contribute to discussions on course content and objectives. And out of such an experience, ideas for using computer conferencing in teaching may well develop.

Optimisation of computer-mediated communication technologies for distance education will flow from two key features – the potential for group communication, and the fact that all information can be stored, organised, and retrieved at will. Straight away, this provides an opportunity for learners in the system to contribute and share their own knowledge and experience, changing a course from an inert set of pre-packed materials in to something much more dynamic and learner-centred. Research is needed to investigate how computer-mediated communication can best be used to facilitate cooperative learning, discovery learning, and development of problem-solving and critical thinking skills. On the negative side, it will also be necessary to identify ways of helping users deal with the potential information overload which often occurs on systems using these technologies.

Conclusion

In general, computer-mediated communication has the potential for being more than just an electronic substitute for correspondence tuition and face-to-face meetings in the distance education context. This potential will be increasingly realised as the necessary equipment and software, coupled with access to low-cost communications networks, becomes more widely available. And, although this

chapter has concentrated on applications in large-scale distance teaching institutions (because this reflects the author's current preoccupations) there is no doubt that many of the more flexible and smaller-scale open learning projects could also use these technologies to enhance the learning process. Initially, this would probably be in cases where frequent face-to-face group meetings are difficult, inconvenient, or expensive to organise, but as experience with using these technologies for educational purposes builds up, so new applications will develop – cooperative networking projects, skill exchanges, and peer teaching are some of the more exciting examples which come to mind.

Further reading

For a general presentation, discussion, and evaluation of computer-mediated communication, see:

E Kerr and S Hiltz, *Computer-Mediated Communication Systems. Status and Evaluation*, New York, Academic Press, 212 pp, 1982.

For information on computer conferencing systems and software, see:

The special issue of *BYTE Magazine*, December 1985 – this contains a number of articles, including an excellent overview of currently available computer conferencing systems.

IEEE Transactions on Professional Communication, March 1986, Vo. LPC-29, No 1: Special Issue on Computer Conferencing. (This contains eight papers on computer conferencing.)

For publications specifically on applications of computer conferencing to education, see:

L Davie and P Palmer, 'Computer Teleconferencing for Advanced Distance Education' in *Canadian Journal of University Continuing Education*, X VOL 2, 56–66, 1984.

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